DOCUMENT RESUME

ED 084 822 EM 011 641

AUTHOR	Perry, Robert P.
TITLE	LRC Computer Network.
INSTITUTION	Mercer County Board of Education, Princeton, W. Va.
SPONS AGENCY	Bureau of Elementary and Secondary Education (DHEW/OE), Washington, D.C.
PUB DATE	Nov 73
NOTE	9p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Computer Assisted Instruction; *Computer Oriented Programs; Computer Science Education; *Consortia; Low Ability Students; Mathematics Instruction; Program Descriptions; *Rural School Systems; Science Instruction; Secondary Grades; Secondary School Mathematics; Secondary School Science
IDENTIFIERS	Educational Computer Networks; West Virginia

ABSTRACT

A consortium of small rural school districts in West Virginia was created to sponsor a regional educational computer network. The project sought to provide computer science education for selected students, to complement science and mathematics instruction through computer-assisted instructional (CAI) problem-solving activities, and to aid administrative services. Seventy-five teachers received training and participated, along with 2000 secondary students. In general, it was found that the computer performed calculations well, relieved students of tedious tasks, aided evaluations, promoted problem-solving and discovery learning, improved instruction and motivated students and teachers. All of the 647 students who took the computer science course passed at least 80% of the performance objectives and 90% of them used their skills afterwards. In the math and science courses, pre- and posttests of selected units revealed an improvement of 40% in student performance after five hours of CAI instruction. Low ability students using CAI showed marked gains in both reading and math, and administrative tasks were successfully handled by the computer. Thus, it was concluded that consortia of small districts could justify the expense of a computer network. (LB)

FILMED FROM BEST AVAILABLE COPY

U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

ED 084822

I. Descriptive Data

A. Major Area of Concern: A regional educational computer network for the purpose of computer science instruction and the complimenting of science and mathematics instruction through computer assisted problem solving activities.

B. Project Title: LRC Computer Network

C. Project Director: Robert P. Parry
Address: Campus Box 16, Bluefield State College
Bluefield, West Virginia 24701
Telephone: (304) 327-5951

D. Superintendent of Schools: Clinton D. Lilly
Address: Mercer County Board of Education
1420 Honaker Avenue
Princeton, West Virginia 24740
Telephone: (304) 425-2117 or 425-8774

E. Level of Funding:

Initial Grant	$ 88,000.00	Date: 1/15/71 to 1/14/72
1st Continuation	$ 79,000.00	Date: 1/15/72 to 1/14/73
2nd Continuation	$ 90,000.00	Date: 1/15/73 to 1/14/74
Demonstration Year	$ 90,000.00	Date: 1/15/74 to 1/14/75
TOTAL . . .	$347,000.00	

EM 011 641

II. Project Description

A. Overview of Project:

1. Computer educational networks had their inception in metropolitan school districts. Equipment cost and lack of trained personnel has blocked rural public school students from the mainstream of computer technology. It was the opinion of the project planners that a consortium of several small rural school districts can justify a computer network effort where a single sparsely populated district can not possibly afford the equipment and personnel. Innovative factors of the project which qualified for Title III support included the absence of computer networks in rural areas and the possible cost effectiveness solution offered by several school districts participation. A Board of Directors, comprised of the chief school officer from each of the eight participating counties, became the project's decision-making group. It is the consensus of this Board of Directors that some public school students should have extensive computer science training by choice and all students should have some computer problem solving application experience to succeed in the pursuit of their vocation after graduation.

2. Providing the computer capabilities of modern technology to high school administrators, teachers and students in a rural setting is the chief goal of the LRC Computer Network project. More specific goals are to provide formal computer science training, assist problem solving activities in mathematics and science classes, computer assisted instruction in consumer arithmetic for special education classes and school administrative services such as scheduling and ranking of students.

3. Target populations served by the project encompass secondary students from the West Virginia counties of Mercer, McDowell, Wyoming Raleigh, Fayette, Summers, Monroe and Greenbrier. This area consists of approximately 4, 600 square miles of mountainous terrain for which the chief industry is the production of bituminous coal.

The mean educational level of residents in the age bracket twenty-five years and older is 8. 5 years with a current per capita income of less than $2, 000 per year. A declining school population consists of 32, 436 elementary and 29, 144 secondary students instructed by 1, 792 elementary and 1, 590 secondary teachers. Initially, the project was funded by ESEA Title III to serve the largest high school in each of the eight counties reaching 647 students with extensive computer science training. In two years, the project has expanded with the aid

of LEA funds to reach twenty schools and directly instructionally effect in excess of 2,000 students. In excess of 15,000 students are benefiting from computer administrative services.

A total of seventy-five certified secondary teachers have been trained in three three-hour graduate extension classes to utilize computer terminal in classroom instruction. The project director and field coordinator are certified in administration or supervision and have had previous computer experience.

Classroom materials for each computer science student consists of a FORTRAN PRIMER; for the mathematics program, the CAMP paperback series that correlates CAI with secondary school mathematics; for the science program, EDINET SCIENCE; and for the consumer arithmetic a locally developed series of CAI lessons on magnetic tape for use at the student's terminal. Each of the aforementioned materials are accompanied by a teacher's manual which provides performance objectives and criteria tests.

Project funds have been and are used to provide housing for the computer and project offices at Bluefield State College, to purchase a time-sharing computer, lease phone lines to participating schools, purchase terminals for the original eight schools and to lease line printing equipment for administrative services. The participating schools provide a small room to house the computer terminal away from the classroom or a sound reduction carrel to surround the classroom terminal. A telecomputer television terminal is shared by the schools for large group instruction.

B. Objectives and Activities:

1. Each of the following project objectives had a time limit of one project year.

(1) In excess of six hundred secondary students will meet the criteria defined for the computer science curriculum.

(2) Selected secondary teachers from each participating school will receive three or more graduate hours in computer science and CAI instruction.

(3) Selected mathematics and science students will demonstrate their computer use in problem solving activities by improved scores on pre and post criteria tests.

(4) Special education consumer arithmetic units will be developed by the project staff and used with secondary age students of seventy-five and below I.Q. to increase their arithmetic abilities as measured by the WRAT and criteria tests.

(5) All project schools will utilize computer scheduling and ranking services to achieve balanced class size, ability grouping, increased curriculum offerings and overcome student transportation problems associated with rural consolidated schools.

2. A computer network consisting of a time-sharing computer, data lines and teletype terminals has been established to accomplish project objectives. Project teachers have received computer science and CAI training from NSF and project sponsored graduate classes. Secondary students utilize teletypewriter terminals for computer science training, problem solving activities and to compete during computer contests in both BASIC and FORTRAN languages. Special education students at Park Ungraded High School are instructed at the computer terminals in consumer arithmetic. The computer paces and evaluates special education students presenting randomly generated application problems at each student's ability level. One day workshops have been conducted with project school administrators relative to the computer services available to their schools. All project schools have utilized the computer network for administrative purposes.

3. Computer science, mathematics and science students attack problems that would take a life time to do by hand computations. Students throughout the computer network enjoy exchanging complex problems and solutions while participating in computer contests. Several students have been contacted by local civic, service and industrial groups to do statistical data studies for them and in some cases, were paid for this service. High school principals have employed their students after school hours to assist in computer administrative applications. Athletic departments have used the computer network facilities during non-instructional hours to analyze individual and team statistical information.

Surveys indicate that instructional supervisors, classroom teachers and students strongly agree that computers are valuable to instruction in that they perform complicated lengthy calculations, evaluate functions, relieve students from the drudgery of repeated operations, help present a clear demonstration of mathematical ideas and relationships, promote problem analysis helps develop general

algorithms, causes teachers to expand the curriculum to include modern technological applications, promotes exploration and discovery techniques, strongly motivates both teacher and student and presents a vehicle to transport students and teachers into the world of computer simulation techniques. Special Education students have demonstrated a curiosity about the computer that presents their instruction to the extent that classroom teachers have provided plastic computer logic kits to students for experimenting with binary arithmetic and elementary logic.

All participating students, teachers, administrators and some local civic groups have toured the LRC Computer Network Headquarters. Civic groups from the communities of the participating schools have requested and received special presentations on the LRC computer work from project staff and participants. Several local industries have requested and received data processing advise from the project staff and in turn have given uncompensated consultant services to the project staff in solving technical communications problems. The number of local industries that employed the network's former computer science students indicates a local need is being satisfied by the project. The two commercial television stations located within the project area are continuing to present several interview type programs with project participants.

C. Evidence of Effectiveness:

1. Numerical count of participants, student written computer programs and computer terminal usage hours are collected to ascertain the acceptance and use of computer terminals by administrators, teachers and students. Staff selected computer science criteria examinations are administered to assess the extent that computer science students meet defined behavioral course objectives. Student required programs are checked as they directly relate to behavior objectives. Teacher committee prepared criteria tests based on behavioral objectives of science and mathematics computer usage units are administered as pre and post-tests to determine student gain in skill areas defined in the units. Periodic inservice, evaluation and planning conferences are held with administrators and teachers to determine network effectiveness and to plan project expansion. The principle statistical methods used in project evaluation are the comparisons of the mean differences of pre and post standardized achievement and criteria based tests.

2. Evaluation processes are conducted by certified professional educators who are working in the participating school or on the project

staff. Their findings were validated by an outside team of educators and the State Department of Education in cooperation with the USOE and the NACSCS. Teacher and staff prepared criteria tests from computer science, mathematics and science units are valid and reliable to the extent that they test the skills defined by behavioral objectives written for each unit of study. The two forms of the Wide Range Achievement Test used to pre and post-test special education consumer math students has acceptable validity. All student participants are included in testing except in the cases of absenteeism on test day.

All of the project's 647 computer science students have met 80% or more of the performance objectives for the defined curriculum based on criteria testing. Surveys of students after graduation revealed that in excess of 90% of them are applying their computer science skills in pursuing their chosen vocation.

Mathematics and scie ce teachers report a mean difference from pre and post criteria te s of approximately 40% on units of study requiring a mean time of 5 hours of instruction involving in excess of 1,200 students over a two year period. Surveyed attitudir l change reveals that a more positive attitude toward subject matter and computer technology is noted. Cases where teachers reported both a class which used the computer and one that did not, noted no marked difference in subject matter performance but did note the programming skills gained by the experimental class. This programming skill gain is considered important by both the student and the teacher.

A cumulative-dificit phenomenon characteristic of twenty-five secondary special education students with a mean chronogical age of 17 years must be considered with comparing pre and post WRAT scores. With a mean I.Q. of 67, reading level of 3.7 years and math level of 3.6 years, they should not be expected to gain knowledge at a normal rate. However, from the end of September to the beginning of February, four months of instruction, these students had a mean gain of 5.55 months in mathematics and 4.6 months in reading. The reading gain was noted because of the controlled reading effect a teletype terminal has when presenting step by step instruction. Pre and post consumer arithmetic criteria tests revealed a mean gain of 4.5 per cent. CAI instruction was used between pre and post tests.

Participating school principals were interviewed by the out of state validation team members and voluntarily confirmed the survey results that computer applications in scheduling yields balanced class size, realistic ability grouping and increased curriculum offerings.

Furthermore, it assists with the early and late class scheduling problems associated with transportation problems characteristic of rural consolidated schools serving large mountainous areas. Class ranking by computer has proved to be efficient and accurate.

D. Costs:

The LRC Computer Network is providing a unique service for eight county school districts at a moderate cost. No planning grant was available for the project, however, approximately $1,500 in staff time was contributed by LEA for proposal development, securing funding and initial ordering of equipment. The project considers as "in kind" services the $625 per pupil per year LEA total expenditure. The instructional cost above "in kind" services was $124 per pupil the first year and the administrative services at $2 per pupil. The current cost is $86 per pupil in instruction and .65 per pupil in administrative services. If the administrative services were paid for by the LEA for all secondary students at $2 per pupil it would fund the total project reaching ten per cent of the students with instructional phases of the project. Three hours graduate level computer science training for teachers has had an average cost of $120 per teacher. On three occasions the cost was provided by NSF in-service institutes.

E. Publications and Materials:

The "FORTRAN Primer" is available from International Textbook Company, "Computer Assisted Mathematics Programs" Grades 7-12, from Scott, Foresman and Company and "EDINET CAI Instruction Series and similar CAI series are available in all subject areas from most computer companies which solicit public schools to purchase instructional equipment. The above listed items have an average cost of less than $5 per book.

Curriculum guides for computer science, teacher prepared CAI mathematics and science units, and special education consumer arithmetic are available from the project at a printing cost of $4 per book. This would include hard paper copies of the CAI materials that have been developed by the project and are recorded on magnetic tape. All materials are in standard BASIC or FORTRAN languages commonly available with computer systems.

F. Exportability Factors:

A school district or group of districts desiring to adopt the project would have to determine if the project is to be a single school

or several schools sharing a computer network. Recent technology has made it possible for a single school to purchase a computer of one terminal usage for less than $6,500. Time sharing systems have an average purchase cost of $24,000 plus approximately $1,500 per terminal cost at each school up to sixteen terminals. An alternative 8% leasing cost per month is common among educational computer vendors. After the first year, 3% of the purchase price must be budgeted for maintenance. Maintenance is generally provided by the computer company during the first year. The leasing cost alternative does include the maintenance cost. Software cost will initially cost about $10 per pupil in instructional applications. Expendable supplies cost approximately $5 per pupil per year. Administrative application's software and expendable supplies cost approximately .50 per pupil. A project coordinator must be provided by released time or full-time depending on the magnitude of the project. Staff training has had a cost of $120 per instructor.

Decision makers for school districts who feel computer technology skills are important to school graduates should consider this project worth the cost of adoption.

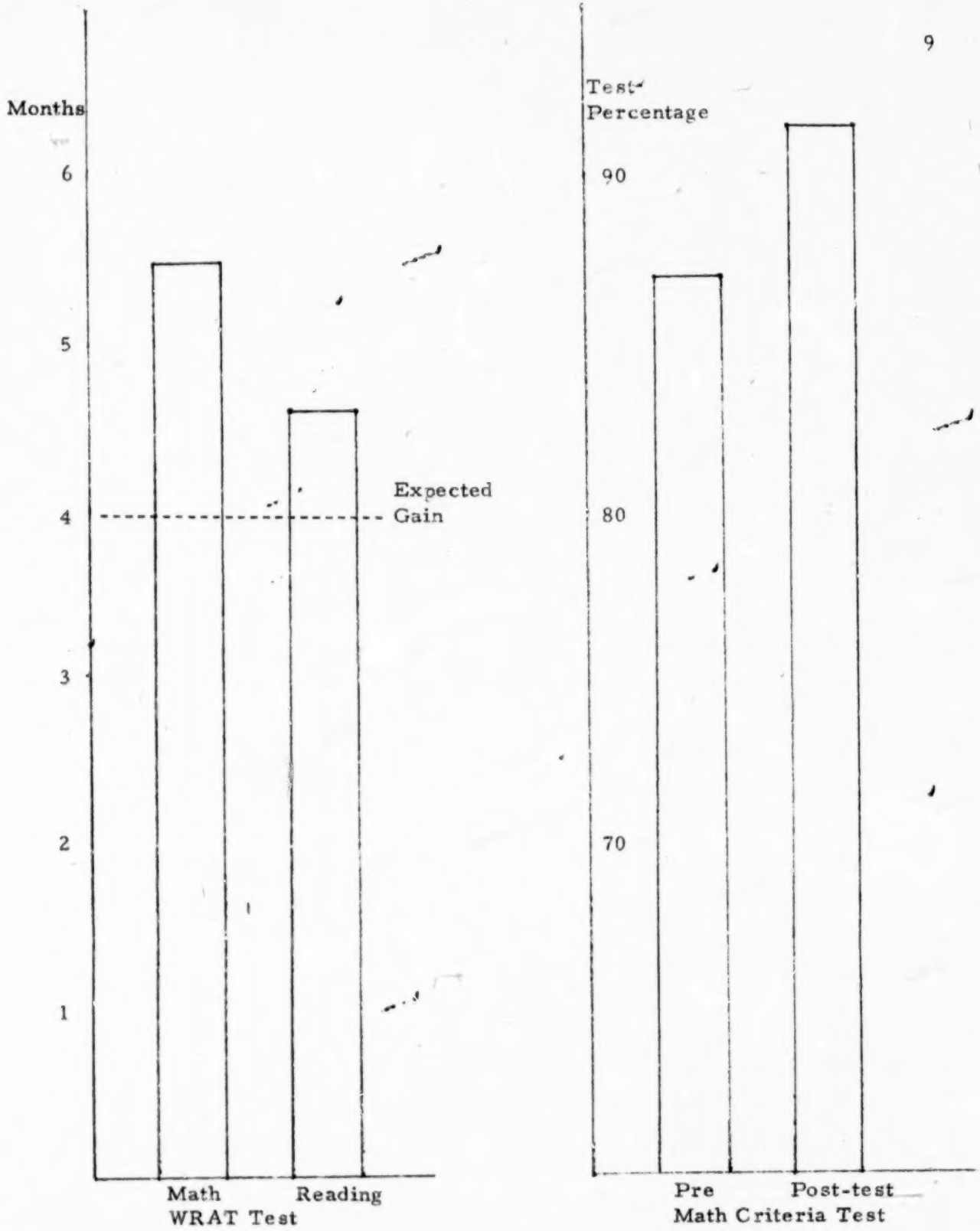

TABLE I
SPECIAL EDUCATION
CONSUMER MATH RESULTS